



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

RAMP

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Robotic Armed Maneuver Platform (RAMP) aka Wingman



Interoperable Software Architectures



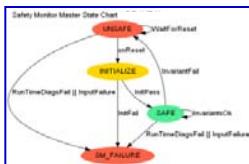
Notional Armed Turret



Integrated Platform And Turret Control



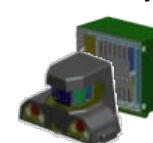
UGV Safety Systems



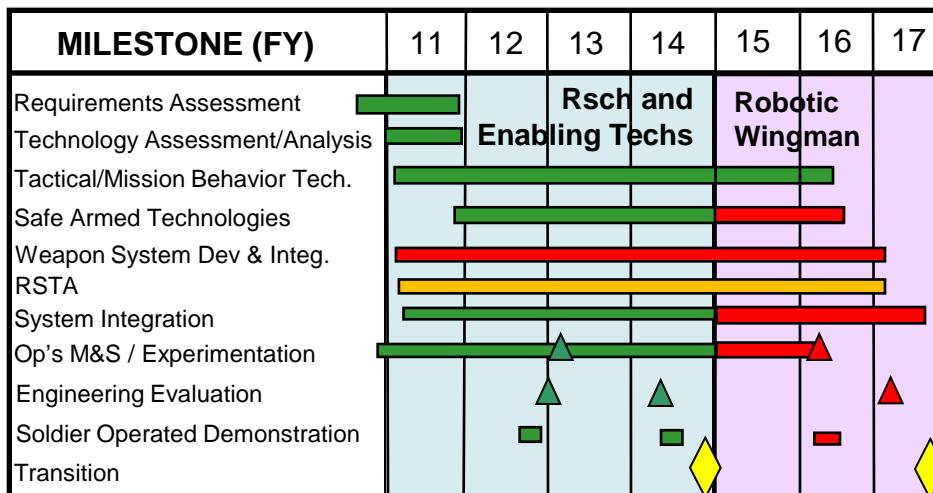
Notional UGV Platform



Autonomous Navigation & Behaviors System



Schedule & Cost



Purpose:

Develop, integrate, and demonstrate an armed robotic platform that is capable of performing tactically relevant maneuvers.

Products:

Safe Armed Operations

- Aided target recognition & engagement**
- Automated turret control**
- Low latent remote fire**

Autonomous Tactical Behaviors

- Automated maneuvers in tactical formations**
- Interaction of Manned and Unmanned Systems:**
- Manned/unmanned intelligent teaming through advanced unmanned vehicle systems**
- Common command and control of platform and turret**

Payoff:

- Get Robotic Platforms in the Hands of the User**
- Reduce Fleet Weight**
- Increased Warfighter Survivability**
- Increased Warfighter Lethality**
- Reduced risk of future armed UGV integration**



RAMP Wingman Enabling Technologies



Pre 2009

2009

2010

2011

2012

2013

2014

2015

2016

2017

Robotic Follower

Convoy Active Safety Technologies

Near Autonomous
Unmanned System

Robotic Vehicle Control Architecture

Multiple previous efforts culminate in
the Robotic Wingman

Robotic Armed Maneuver Platform (RAMP) - Wingman

ARL CTA

Safe Operations of Unmanned Systems for Reconnaissance in
Complex Environments

Safe Ops

Increased Mobility and Operational
Performance through Autonomous
Technologies

Robotics CTAs



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SOURCE

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D.TAR.2009.03 Safe Operations of Unmanned systems for Reconnaissance in Complex Environments (SOURCE)



Schedule & Cost

MILESTONE (FY)	09	10	11	12
Technology/Requirements Assessment				
Perception & Control Technologies - Safe Operations, Situational Awareness		5		6
Tactical/Mission Behavior Technologies - Cooperative & Dynamic Behaviors		5		6
Platform Integration				
Engineering Evaluation				
M&S Experiments				
Field Experiments		5		6
Total	TARDEC ARL ERDC			

Purpose:

Develop and demonstrate Perception, Intelligence, control and Tactical Behavior technologies that are required for autonomous collaborative unmanned systems (UMS) & Soldiers to conduct safe operations in a dynamic urban environment.

Products:

- Perception sensors & planning algorithms for safe operations in dynamic/urban environments
- Tactical behaviors for mission execution (including MULE and SUGV class robots)
- Modeling & simulation software
- Integrated testbeds and data to develop UGV safety & testing procedures/methodologies in preparation for Interim Qualification Testing (IQT)
- Quantitative performance data to enable development of TTPs for UGVs

Payoff:

- Remove warfighter from hostile situations
- Safer operations of UGVs in proximity to pedestrians and vehicles
- Increase in vehicle autonomy to enable less supervisory burden and reduced network loads
- Increased UGV situational awareness
- Robust soldier/robot and robot/robot teaming behaviors
- Robust UGV performance in all environments/conditions



D.TAR.2009.03 SOURCE Joint Partnership Overview

TARDEC

- Maturation, Integration & Demonstration



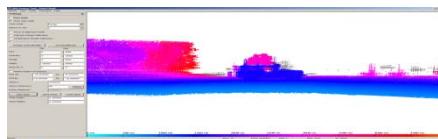
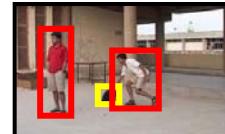
ERDC

- Physics-based Simulation



ARL/VTD

- Perception, Planning & Tactical Behavior Algorithms



ARL/HRED

- Soldier-robot teaming and trust in automation



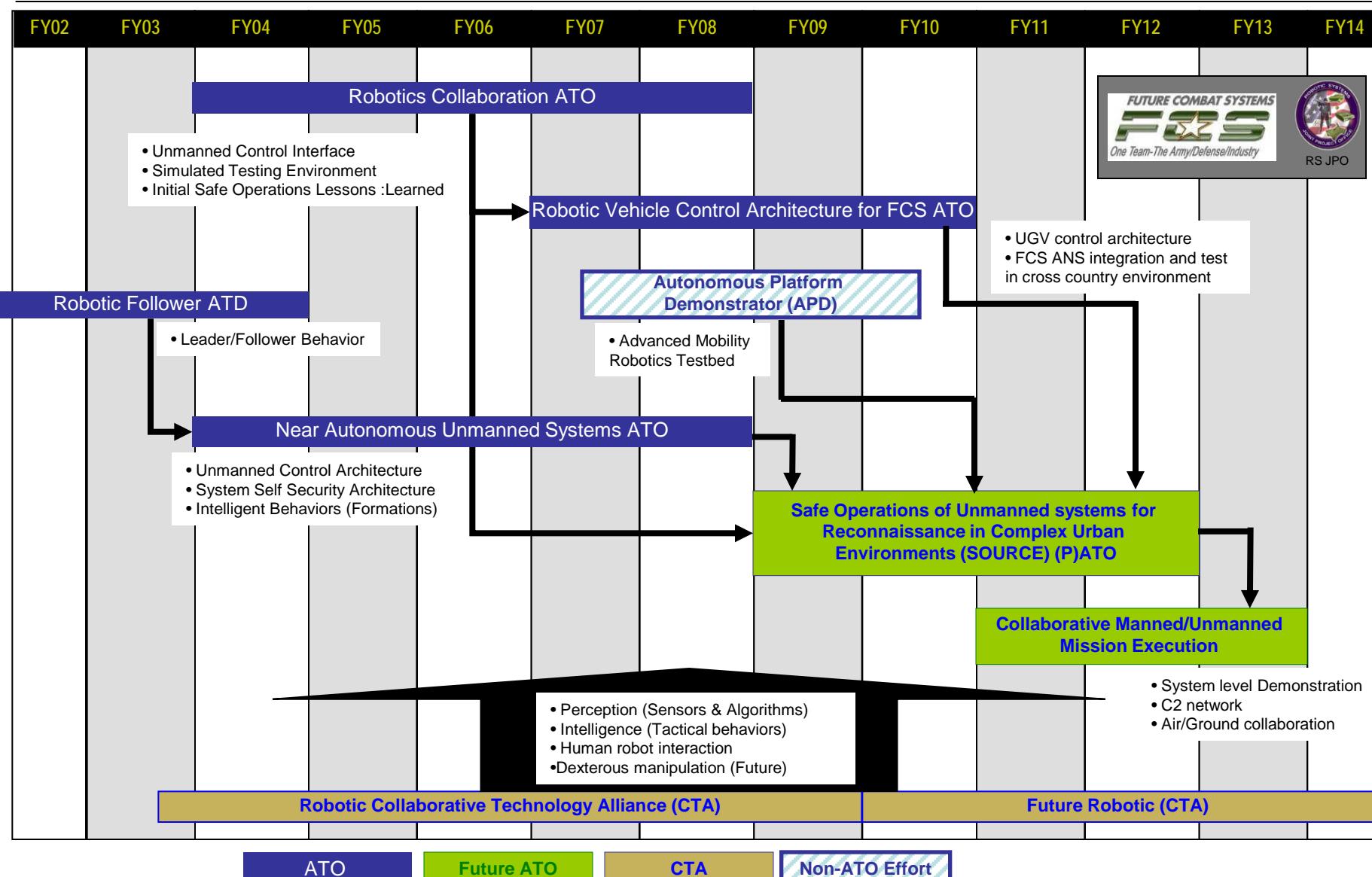
ARL/CISD

- Indoor Navigation & Mapping





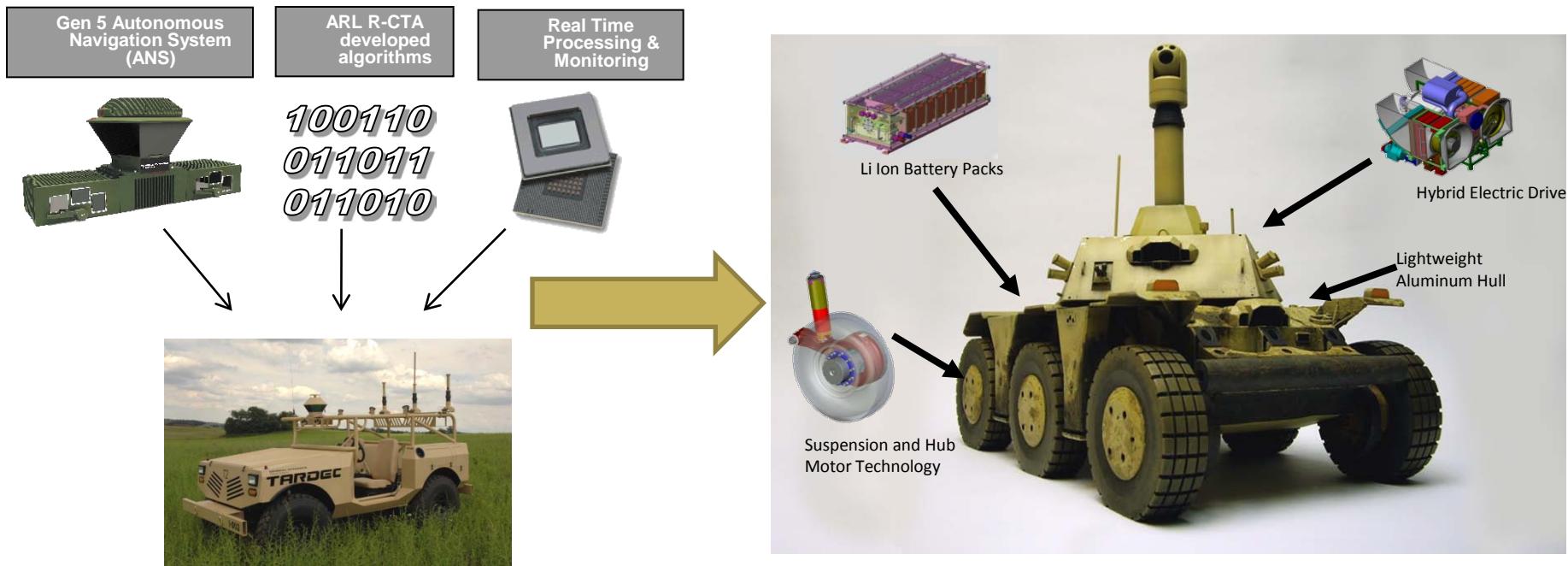
D.TAR 2009.03 Safe Operations of Unmanned systems for Reconnaissance in Complex Environments (SOURCE)





SOURCE Large Platform

- Autonomously maneuver, operate and negotiate urban terrain
- Autonomously traverse paved roads at sustain speeds of 45KPH
- Autonomously traverse complex urban terrain at 8 KPH
- Detect oncoming vehicles at oncoming speeds of 80KPH and ranges of 50m
- Detect and Track humans up to 50m (standing and moving) and at speeds up to 10KPH
- Detect and avoid non-human entities moving at 10KPH





SOURCE – Small Robots

OBJECTIVE

- Enable dismounted operations of small scale robots in urban and complex environments using collaborative semi and fully autonomous behaviors, persistent surveillance, and mapping.

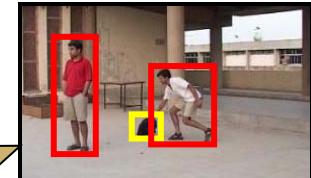
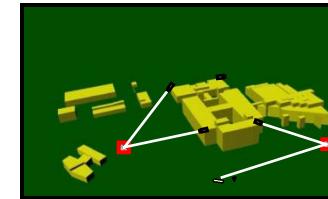
CHALLENGES

- Limited autonomous behaviors for SUGV
- Sensors don't yet exist to enable full autonomy on small robots
- Localization challenges in GPS-denied environments
- Persistent surveillance technology (including on moving robot)

SOLDIER PAYOFF

- Reduced Soldier Workload
- Enhanced Situational Awareness

Persistent Surveillance



Indoor Navigation And Mapping

